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Laursen, Martin Frederik; Zachariassen, Gitte; Bahl, Martin Iain; Bergström, Anders; Høst, Arne; Michaelsen, Kim F.; Licht, Tine Rask

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Older siblings affect gut microbiota development in early childhood

Martin Frederik Laursen¹, Gitte Zachariassen², Martin Iain Bahl¹, Anders Bergström¹, Arne Høst², Kim F. Michaelsen³ & Tine Rask Licht¹

¹National Food Institute, Technical University of Denmark, Mørkhøj Bygade 26, DK-2860 Søborg, Denmark

²H.C. Andersen Children's Hospital, Odense University Hospital, Sdr. Boulevard 29, DK-5000, Odense C, Denmark

³University of Copenhagen, Department of Nutrition, Exercise and Sports, Rolighedsvej 30, DK-1958

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Background: Evidence suggests that early life infections, presence of older siblings and furred pets in the household affect the risk of developing allergic diseases through altered microbial exposure. Recently, low gut microbial diversity during infancy has also been linked with later development of allergies.

Methods: We investigated whether presence of older siblings, furred pets and early life infections affected gut microbial communities at 9 and 18 months of age and whether these differences were associated with the cumulative prevalence of atopic symptoms of eczema and asthmatic bronchitis at three years of age. Bacterial compositions and diversity indices were determined in fecal samples collected from 114 infants in the SKOT cohort at age 9 and 18 months by 16S rRNA gene sequencing. These were compared to the presence of older siblings, furred pets and early life infections and the cumulative prevalence of diagnosed asthmatic bronchitis and self-reported eczema at three years of age.

Results: The number of older siblings correlated positively with bacterial diversity ($p = 0.030$), diversity of the phyla Firmicutes ($p = 0.014$) and Bacteroidetes ($p = 0.004$) and bacterial richness ($p = 0.006$) at 18 months. Further, having older siblings was associated with increased relative abundance of several bacterial taxa at both 9 and 18 months of age. Compared to the effect of having siblings, presence of household furred pets and early life infections had less pronounced effects on the gut microbiota. Gut microbiota characteristics were not significantly associated with cumulative occurrence of eczema and asthmatic bronchitis during the first three years of life.

Conclusions: Presence of older siblings is associated with increased gut microbial diversity and richness during early childhood, which could contribute to the substantiation of the hygiene hypothesis. However, no associations were found between gut microbiota and atopic symptoms of eczema and asthmatic bronchitis during early childhood and thus further studies are required to elucidate whether sibling-associated gut microbial changes influence development of allergies later in childhood.

The work has recently (July 2015) been accepted for publication in BMC Microbiology